CLAIMS

What is claimed is:

1. An electronics interface for interfacing to a light detector, the electronics interface comprising:

a tuner having an input coupled to the output of the light detector and an output, the tuner adapted to receive a detector signal from the light detector, the detector signal comprising a plurality of modulation signals, each one of the plurality of modulation frequencies corresponding to a different aspect of an image of body tissue;

an analog-to-digital converter having an input coupled to the output of the tuner and an output; and

a first memory buffer having an input coupled to the output of the analog-to-digital converter and an output.

2. The electronics interface of claim 1, further comprising:

a data bus coupled to the output of the first memory buffer; and

a second memory buffer having an input coupled to the data bus and an output.

3. The electronics interface of claim 1, further comprising a digital-to-analog converter having an input coupled to the output of the second memory buffer and an output.

4. The electronics interface of claim 3, wherein the output of the digital-to-analog converter is coupled to an ultrasound console.

5. The electronics interface of claim 1, further comprising a controller coupled to an ultrasound motor encoder for synchronizing the electronics interface with an ultrasound console.

6. The electronics interface of claim 1 wherein the different aspect of the image is a different image depth.

7. The electronics interface of claim 1 wherein the different aspect of the image is a different image brightness.

8. The electronics interface of claim 1, wherein the tuner sequentially tunes to each one of the modulation frequencies of the detector signal.

9. The electronics interface of claim 5, wherein the controller instructs the tuner to sequentially tune to each one of the modulation frequencies of the detector signal.

10. The electronics interface of claim 9, wherein the controller coordinates the timing of the tuner and the analog-to-digital converter such that the analog-to-digital converter acquires at least one digital datum for each tuned modulation frequency of the detector signal.

11. The electronics interface of claim 10, further comprising:

a data bus coupled to the output of the first memory buffer; and

a second memory buffer having an input coupled to the data bus and an output;

wherein the analog-to-digital converter writes its digital data to the first memory buffer and the first memory buffer writes the received digital data to the second memory buffer via the data bus.

12. The electronics interface of claim 11, further comprising a digital-to-analog converter having an input coupled to the output of the second memory buffer and an output coupled to the ultrasound console.

13. The electronics interface of claim 12, wherein the controller instructs the second memory buffer to output the digital data received from the first memory buffer to the digital-to-analog converter when the controller receives a subsequent encoder pulse from the ultrasound motor encoder.

14. The electronics interface of claim 13, wherein the second memory buffer outputs the digital data to the digital-to-analog converter in the form of a digital data sequence.

15. The electronics interface of claim 13, wherein the digital data in the digital data sequence are arranged in order of increasing image depth.

16. The electronics interface of claim 13, wherein the digital data in the digital data sequence are arranged in order of decreasing image depth.

17. The electronics interface of claim 13, wherein the digital-to-analog converter converts the received digital data into an analog signal and outputs the analog signal to the ultrasound console.

18. The electronics interface of claim 11, further comprising a logic control having an input coupled to the second memory buffer and an output coupled to a digital input of the ultrasound console.

19. The electronics interface of claim 18, wherein the controller instructs the logic control to transfer the digital data stored in the second memory buffer to the

ultrasound console when the controller receives a subsequent encoder pulse from the ultrasound motor encoder.

20. The electronics interface of claim 19, wherein the control logic transfers the digital data to the ultrasound console in form of a digital data sequence.

21. The electronics interface of claim 20, wherein the digital data in the digital data sequence are arranged in order of increasing image depth.

22. The electronics interface of claim 20, wherein the digital data in the digital data sequence are arranged in order of decreasing image depth.

23. The electronics interface of claim 13, wherein the tuner sequentially tunes to each one of the modulation frequencies of the detector signal.

24. The electronics interface of claim 1, wherein the electronics interface is coupled to a single light detector.

25. The electronics interface of claim 1, wherein the electronics interface is coupled to a plurality of avalanche mode photodiodes.

26. The electronics interface of claim 1, wherein the image is an optical coherence tomographic image of body tissue.

27. An optical system for imaging body tissue comprising:

a beam generator which receives a light beam and generates a reference light beam and a sample light beam, the sample light beam being directed at body tissue to be imaged;

a first coupler which receives the reference light beam and generates a plurality of reference light beams;

a plurality of first optical fibers, each first optical fiber being coupled to receive one of the plurality of reference light beams;

a plurality of modulators, each modulator being coupled to one of the plurality of first optical fibers for receiving one of the plurality of reference light beams from one of the plurality of first optical fibers, each modulator modulating the reference light beam at a unique modulation frequency;

a plurality of second optical fibers, each one of the second optical fibers being coupled to one of the plurality of modulators for receiving the modulated reference light beam from the modulator;

a second coupler which receives a reflected sample light beam which is reflected off the body tissue; and

a beam combiner coupled to the second coupler, the beam combiner

receiving the reflected sample light beam from the second coupler, receiving the modulated reference light beam and generating a combined light beam.

28. The optical system for imaging body tissue of claim 27 wherein the beam generator is a beam splitter.

29. The optical system for imaging body tissue of claim 28 wherein the beam splitter splits the received light beam into the reference light beam and the sample light beam where the reference light beam and the sample light beam have a desired proportion of power.

30. The optical system for imaging body tissue of claim 27 wherein each one of the plurality of modulators includes a Lithium Niobate crystal, where a sinusoidal voltage is applied to the crystal to modulate the frequency of the reference light beam.

31. The optical system for imaging body tissue of claim 27 further comprising a beam merger coupled to the plurality of second optical fibers, the beam merger receiving the modulated reference light beams from the plurality of second optical fibers and merging the modulated reference light beams into a merged reference light beam.

32. The optical system for imaging body tissue of claim 31 wherein the beam merger is a lens.

33. The optical system for imaging body tissue of claim 31 further comprising a third coupler coupled to receive the merged reference light beam from the beam merger.

34. The optical system for imaging body tissue of claim 33 wherein the third coupler directs the merged reference light beam to the beam combiner.

35. The optical system for imaging body tissue of claim 27 further comprising a light detector which is coupled to the beam combiner to receive the combined light beam.

36. The optical system for imaging body tissue of claim 35 further comprising a lens coupled to the beam combiner, the lens receiving the combined light beam and directing the combined light beam to the light detector.

37. The optical system for imaging body tissue of claim 27 wherein the combined light beam carries a first information and a second information about the body tissue.

38. The optical system for imaging body tissue of claim 37 wherein the first information is image depth information of the body tissue.

39. The optical system for imaging body tissue of claim 38 wherein the second information is image brightness information of the body tissue.

40. The optical system for imaging body tissue of claim 38 wherein the image depth information is provided by the different modulation frequencies of the modulated reference light beams.

41. The optical system for imaging body tissue of claim 39 wherein the image brightness information is provided by the light intensity of the combined light beam.

42. The optical system for imaging body tissue of claim 27 wherein the combined light beam is the result of interference between the reflected sample light beam and the modulated reference light beam.

43. The optical system for imaging body tissue of claim 42 wherein each one of the plurality of second optical fibers has a different path length.

44. The optical system for imaging body tissue of claim 27 wherein the plurality of modulators are coupled to the plurality of first optical fibers such that the plurality of reference light beams do not travel in free space.

45. A method for processing an optical coherence tomographic image of body tissue, the method comprising the steps of:

receiving a first signal corresponding to a first image depth;

frequency modulating the first signal into a first frequency modulated signal;

receiving a second signal corresponding to a second image depth;

frequency modulating the second signal into a second frequency modulated signal where the frequency of the first frequency modulated signal is not equal to the frequency of the second frequency modulated signal;

combining the first and second frequency modulated signals into a combined signal.

46. A method of imaging body tissue comprising the steps of:

generating a plurality of reference light beams;

modulating each one of the plurality of reference light beams at a unique modulation frequency to create a plurality of modulated reference light beams;

receiving a reflected sample light beam which is reflected off body tissue; and

generating a combined light beam from the reflected sample light beam and the modulated reference light beam.

47. The method of imaging body tissue of claim 46 wherein the step of generating the plurality of reference light beams includes the steps of receiving a reference light beam and splitting the reference light beam into the plurality of reference light beams.

48. The method of imaging body tissue of claim 46 wherein the step of generating the plurality of reference light beams includes the steps of receiving a light beam and splitting the light beam into the reference light beam and the sample light beam.

49. The method of imaging body tissue of claim 46 wherein the modulating step includes the step of applying a sinusoidal voltage to a Lithium Niobate crystal.

50. The method of imaging body tissue of claim 46 further comprising the step of merging the modulated reference light beams into a merged reference light beam.

51. The method of imaging body tissue of claim 46 wherein the merging step uses a lens.

52. The method of imaging body tissue of claim 46 further comprising the step of detecting light characteristics in the combined light beam.

53. The method of imaging body tissue of claim 46 wherein the combined light beam carries a first information and a second information about the body tissue.

54. The method of imaging body tissue of claim 53 wherein the first information is image depth information of the body tissue.

55. The method of imaging body tissue of claim 54 wherein the second information is image brightness information of the body tissue.

56. The method of imaging body tissue of claim 54 wherein the image depth information is provided by the different modulation frequencies of the modulated reference light beams.

57. The method of imaging body tissue of claim 55 wherein the image brightness information is provided by the light intensity of the combined light beam.

58. The method of imaging body tissue of claim 46 wherein the combined light beam is the result of interference between the reflected sample light beam and the modulated reference light beam.

59. The method of imaging body tissue of claim 46 wherein the plurality of reference light beams are carried in optical fibers and do not travel in free space.